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Washington, DC 20555

Response Letter
NRC Comments on Review of the Decommissioning Plan
Dated February 1991 Used by Fansteel Metals to
Respond to Previous NRC Comments on Review of
Remedial Assessment Work Plan Dated June 1990

Dear Mr. Swift:

We have received and reviewed your letter of December 2, 1991 containing the U.S. Nuclear Regulatory Commission's (NRC) comments regarding the Decommissioning Plan for Fansteel Metals' (Fansteel), Muskogee, Oklahoma facility. Our response to these comments is included in the following material. Some of the comments have resulted in changes to the text of the Decommissioning Plan. Copies of the changed pages have been enclosed as attachments. Vertical lines are present in the left margin of the changed pages to identify the portions of the text which have been revised in response to your comments.

General Comments

Throughout this document there appears to be a lack of understanding of the measurements and analyses which are necessary in order to generate the appropriate data for comparison with the guidelines for release for unrestricted use. The intent, appears to be, to rely heavily on gross alpha and gross beta radiation measurements for all types of media. While this is adequate as a screening method, it cannot be used to demonstrate compliance with the guidelines. Further, if after Fansteel has removed source-material bearing sludges and wastes from the Muskogee site, the residual contamination is such that groundwater-drinking water pathway dose assessments are required to justify its remaining there, adequate data will be needed to support the dose assessments. In addition to the chemical and geohydrological parameters, the radionuclide identities and their quantities and distribution will be needed, for each radionuclide, for input to the assessment of potential doses through this pathway.



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Based on previous experience, we recommend that the use of surface scans for soils, building and equipment surfaces be considered as a method for identifying areas requiring detailed assessments.

The appropriateness of performing surface radioactivity measurements (dpm/100 cm²) only for alpha radioactivity should also be further evaluated. The nature of the activities conducted at these facilities, e.g., dust generating, use of corrosive liquids, etc., along with the decontamination procedures which abrade surfaces, may result in conditions which selectively attenuate alpha particles.

This could lead to an underestimation of the surface radionuclide contamination. In this situation, alpha measurements should be supplemented with measurements for the more penetrating beta radioactivity to assure a more accurate determination of radionuclide contamination on surfaces of your facilities.

There is no mention of procedures to be utilized to prevent cross contamination during the decommissioning process. Options which may be considered are the isolation of clean areas and intermittent monitoring of interface areas in conjunction with the use of appropriate control points.

Response: Fansteel does intend to use determination of gross alpha and gross beta extensively to determine areas of the facility in need of decontamination and to track the progress of that decontamination. Since the only radioactive materials brought to the site are the ores and slags used for recovery of tantalum and columbium, the use of gross alpha and beta as indicators of contamination is appropriate. Available information indicates a predictable linear relationship between gross activity measurements and the concentration of individual radionuclides. Isotopic analyses will be performed as necessary to demonstrate that the cleanup criteria have been achieved. The use of isotopic analyses has been referenced throughout this plan and has been made explicit in response to these comments.

Surface measurements will be conducted for both alpha and beta radiation in buildings and on equipment surfaces.

Specific Comments:

1. Page 2-2, Paragraph 1: For soil, the fractional contributions of total uranium and total thorium must be evaluated to determine whether the guidelines for release for unrestricted use have been met.

The write-up for groundwater implies that the three picocuries/liter of water discharge limit for radium-224 (from Th-232 from natural thorium) and radium-226 (from U-238 from natural uranium) and their daughter radionuclides is based on or derived from the "Old" 10 CFR 20.106 (revised as of January 1, 1991, 56 FR 23, 360, May 21, 1991). The NRC staff have not been able to find this single three picocuries/liter limit for Ra-224 and Ra-226 and their daughters per se in Table II, Appendix B, Section 20.106 of the old 10 CFR Part 20. If this limit is derived by Fansteel and Earth Sciences Consultants, Inc., (ESC, Inc.), from the 10 CFR Part 20 limits, please elaborate on the technical basis.

It should be noted that the allowable concentrations of radionuclides in both the old and new 10 CFR Part 20 are really meant to be for liquid effluents to surface water in unrestricted areas from routine operations and not for groundwater protection at decommissioned sites.

This 3 pCi/l limit for ground water is a factor about three to several orders of magnitude more restrictive than the NRC limits for each of the Ra-224 and Ra-226 series radionuclides in both the old and new 10 CFR Part 20 regulations for radiation protection. (See attached Tables A and B for comparison). It appears to be conservatively protective choice. For decommissioning, we generally recommend the U.S. Environmental Protection Agency's (EPA's) Proposed National Primary Drinking Water Regulations, 40 CFR Parts 141 and 142, which were published on July 18, 1991, (56 FR 33050), as your cleanup criteria, in particular, 40 CFR 141.64, page 33126. These regulations are meant to be applied to drinking water supplies, and we consider them adequately protective for groundwater which is to be released for unrestricted use.

Response: This material stipulates that not more than ten picocuries per gram of soil due to uranium and thorium will be the cleanup criterion. This presupposes the separate measurement of uranium and thorium. See also the response to the general comment. The text of this section has been amended to clarify this matter.

The cleanup criterion for groundwater has been changed in the Decommissioning Plan. The U.S. Environmental Protection Agency National Primary Drinking Water regulations, 40 CFR 141.64, will be used. The text of this section has been amended to reflect this change.

2. Page 2-4, Paragraph 2: It is recommended that gamma readings at grid intersections be supplemented with gamma surface scans. Our past experience has indicated that scanning 100 percent of "high-potential" areas and 20-50 percent of "mid-to-low-potential" areas selectively is extremely useful in the identification of areas requiring a more detailed assessment.

Response: All grid intersections will have gamma measurements taken at the surface and at a height of 1 meter. Beta/gamma measurements will be obtained at the surface only.

3. Page 2-4, Paragraph 3, 4 and 5: It is unclear where the area to be utilized for determination of background levels is located and how it will be selected. The data should be carefully evaluated if background levels are to be determined on the plant site.

Response: The method of determining background radiochemical characteristics has been changed as reflected in the revised Pond Closure Investigation Work Plan dated December 19, 1991. This change has been incorporated into the Decommissioning Plan.

4. Page 2-4, Paragraph 5: The soil concentration guidelines, as interpreted from the NRC Branch Technical Position, dated October 1981, (46 FR 52061),

are stated as total thorium (Th-232 and Th-228) and total uranium (U-238 and U-234) pCi/g above background. If only gross alpha and gross beta analyses are scheduled ("certain soil... may also be subject to analysis for concentration of individual radioactive elements"), how will the comparison to guidelines be performed?

Response: The method of determining background radiochemical characteristics has been changed as reflected in the revised Pond Closure Investigation Work Plan dated December 19, 1991. This change has been incorporated in the Decommissioning Plan.

5. Page 2-5, Paragraph 2: A minimum sampling frequency for surface and subsurface soils should be stated, e.g., sample(s) per m². In addition, analytical procedures must provide sufficient information upon which to compare site soil concentrations with guidelines. Gross alpha and gross beta analyses are generally not sufficient for this purpose.

Response: The actions described in this survey are part of the initial site radiation survey whose primary goal is the delineation of areas that require remediation or decontamination. For these reasons, we intend to utilize the rapid and inexpensive gross alpha and gross beta measurements as indicators of contamination for the purposes of defining the boundaries of contaminated areas and for gauging the progress of decontamination. Isotopic analyses will be performed to confirm successful decontamination.

For the activities described in this paragraph, we cannot yet reasonably stipulate a minimum sampling density. For purposes of characterizing the boundaries of contaminated areas, instrumental measurement or analytical sampling density will be determined in the field based on the apparent size of the area, level of contamination, and distinctness of the boundary. A minimum sampling density can be stipulated for a final survey based on the tolerable probability of missing a hot spot of specified size. This stipulation will be made in the appropriate location.

6. Page 2-5, Paragraph 5, sentence 2: "Upwind samples will be analyzed for gross alpha and beta activity." See general comments regarding the use of gross alpha and gross beta activity determinations and guidelines.

Response: As stated in other comments, Fansteel intends to use gross alpha and gross beta as screening measurements throughout the decommissioning operation. A suitable number of isotopic determinations will be performed as part of initial survey operations as stated in various places throughout the Decommissioning Plan. These isotopic measurements will be used (a) to demonstrate and quantify the utility of gross alpha and gross beta as indicators to be used to guide decommissioning activities and (b) to quantify isotopic background concentrations. For example, in the case of air quality monitoring, any samples obtained from downwind locations that show elevated levels of gross activity will be further analyzed to identify the contributing constituents.

It is entirely possible that no samples will exhibit elevated airborne radioactivity. If this is the case, then five samples from upwind sampling locations that exhibit detectable activity will be submitted for determination of background constituents of airborne radioactivity. The text of this section has been amended to include this additional analysis.

Page 2-5, Paragraph 5 sentence 3: "Results will be expressed both as pCi per standard cubic foot..." The concentrations of radioactivity in air should be expressed in units of " μ Ci/ml" to show compliance with NRC regulations, and for comparison to either the NRC's old 10 CFR Part 20, Appendix B, Table II, Column 1, Maximum Permissible Concentrations above background in air for individual radionuclides or the new (56 FR 23360) 10 CFR Part 20, Appendix B, to §§ 20.1001-2401, Table 2, Column 1, Effluent Concentrations in air.

Response: Units have been amended to microCurie per milliliter.

7. Page 2-6, Paragraph 2: Define "statistically significant."

Response: Statistically significant will have the following definition. A concentration of airborne radioactivity will be considered statistically significant for purposes of triggering a determination of contributing radioisotopes if the activity of a particular downwind sample fails the single tailed Student's t test at the 90 percent confidence level based on the aggregate of background (upwind) samples accumulated to date.

8. Page 2-6, Paragraph 3: See general comments.

Response: Please see response to general comments. All of Section 2.1.3.1 refers to the initial radiation survey to determine the scope of decommissioning activities, not the final survey to determine that decommissioning criteria have been achieved.

9. Page 2-7, Paragraph 2: While the guidelines for building equipment surfaces are given in terms of alpha radiation activity, in some facilities, it is appropriate to monitor beta radioactivity levels, as well as alpha radioactivity levels. Measurement of beta radioactivity may more accurately reflect the residual radioactivity present when surface conditions are such that alpha particles may be selectively attenuated. This occurs when the surfaces are wet, dirty, rusty, abraded, etc.

Our experience has also indicated that the gamma and alpha-beta scans can also be extremely effective in the identification of indoor areas requiring a more detailed assessment. See comment No. 2 for information on appropriate frequency of radiation scans. There is no mention of smears for the evaluation of removable contamination. If a gas flow proportional counter is used, will it be used in the alpha or alpha and beta mode?

Response: We are in agreement. In addition to the alpha emissions survey, an additional detector, another gas proportional counter, will be used at the beta detection voltage. If significant areas resistant to cleanup

operations are encountered, we will consider the purchase of a shielded gamma detector to further define contaminated areas.

Smears will be used to determine that the surface areas have been cleaned. Section 2.1.3.1 refers only to the initial survey to determine the areas that require further study or decontamination.

10. Page 2-7, Paragraph 3: Which guideline will be used to compare the dust and dirt samples collected inside of the building?

Response: Dust and dirt will be considered as other solid or earth materials.

11. Page 2-9, Paragraph 1: Is there any data or reference to support the statement, "No leaching of radioactive species is anticipated. . . ." What type of analysis will be performed on the "washing effluent"? What about analysis for radionuclides other than thorium? Because some of the decay product radionuclides (e.g. Ra-226, Ra-228) have more stringent release limits in Table II of Appendix B, 10 CFR Part 20 than thorium, the washing effluent discharge process must be revised so that compliance with the discharge limits can be established.

Response: In accordance with the requirements of the facility's National Pollutant Discharge Elimination System permit, plant wastewaters have been routinely analyzed for radioactivity including wastewaters that have been in contact with ores and slags. No significant radioactivity has been detected in any of these samples. Therefore, we do not anticipate that they will be detected dissolved in the water used for cleaning plant equipment.

The effluent limits have been modified in accordance with the comment.

12. Page 2-13, Section 2.1.2.6: Explain how you will insure that the excavation of materials (i.e., sludge) from Ponds No. 3 and 5 and closed Pond No. 2 will not leave behind residual radioactive (and for that matter, hazardous chemicals) contamination above NRC guidelines for cleanup of soil for unrestricted use.

Response: This subject is addressed in Section 2.1.2.8. The Decommissioning Plan makes a deliberate distinction between the process residues which are potential commercial materials because of their remaining metal values and contaminated soil which is not.

13. Page 2-14, Section 2.1.2.8, Paragraph 2, Sentence 2: "If the soil is contaminated in excess of 10 picocuries per gram but less than 50 picocuries per gram, it may be blended with a sufficient volume of uncontaminated soil to result in a mixture that is less than 10 picocuries per gram and therefore suitable for release for unrestricted use." The NRC staff needs to know what specific radionuclide concentrations in soil above background are in excess of 10 picocuries per gram of soil and the volume of the contaminated soil or the spatial distribution of these radionuclides. We

have to assume that the natural uranium and thorium at the site (e.g., in soil and sludge in Pond No. 3) contain radium-226 series (from U-238) and radium-224 series (from Th-232) of radionuclides at various stages of decay equilibria and geochemical and physical fractionation. The spatial distribution of the uranium, thorium, and the daughter radionuclides will have to be characterized in the soil and remaining sludge residues by isotopic analysis. Absent this information on the spatial distribution of the uranium and thorium series radionuclides in the soil, we will not approve this mixing or blending of the contaminated soil with clean soil. Our past experience with other licensed sites that have tried this dilution method has shown that it does not yield satisfactory results. We feel that your proposal to use the picocuries of gross alpha and gross beta activity that you measure to classify contaminated soil is flawed because these are not directly comparable to the acceptable concentrations in soil for specific radionuclides of natural uranium and thorium given in Options 1 and 2 of the 1981 NRC Branch Technical Position (46 FR 52061).

EPA's Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response and Office of Radiation Programs will be publishing in final form a Technical Bulletin entitled, "Characterization Protocol for Radioactively Contaminated Soil" in November 1991. This bulletin may provide guidance on how best to characterize and remediate contaminated soils. This person to talk to at EPA regarding this bulletin is either Mr. Robert Dyer or Dr. James Neiheisel at (202) 260-9630. For guidance on volume reduction methods for radioactively contaminated soil please contact Mr. Michael Eagle at (202) 260-9630. See also EPA guidance in "Assessment of Technologies for Remediation at Contaminated Superfund Sites," Report # EPA/540/2-90/001.

Response: The text of this section has been amended to provide for isotopic profiling of the soil prior to blending.

14. Page 2-15, Paragraph 2: See general comments.

Response: Instrument survey for final decommissioning survey will use the same types of instrumentation and measurement procedures as those used for the initial survey.

15. Page 2-15, Paragraph 3: Does this mean a total of 20 samples from each remediated area or 20 for the entire site? See general comments regarding use of gross alpha and gross beta data.

Response: The statement refers to each study area separately. Data accumulated to date indicate that alpha activity is a good predictor of uranium and thorium concentrations in soil. Additional data will be collected during the decommissioning operations to test, confirm, or refute the utility of gross alpha and beta as a predictive tool for the materials on this site. In order to satisfy NRC reservations about this matter, Fansteel is willing to stipulate that a minimum of 25 percent of all final decommissioning survey soil and earth materials samples will be analyzed

for isotopic determination of radioactive constituents remaining in the soil.

16. Page 2-15, Paragraph 4: Does this mean a total of 10 samples "from areas not previously found to contain contaminants"? What about areas for which there was a high potential for cross contamination as a result of remedial actions? See general comments regarding the use of gross alpha and gross beta data.

Response: These ten samples will be obtained from areas outside the decommissioning activity areas. Areas likely to be affected by decommissioning activities will be included in the areas subject to the more intense evaluation procedures.

Samples from outside the decommissioning operations areas that show no more than previously measured background levels of activity really do not merit the additional expense of isotopic determinations. Of course, any of these samples that do show elevated radioactivity will be subject to specific radionuclide analysis to determine if areas of contamination have been missed.

17. Pages 2-19 and 2-20: Decontamination techniques such as those described are of the type which significantly abrade building and equipment surfaces. Under these conditions, it is our experience that measurements for alpha activity should be supplemented and/or replaced with measurements for beta activity.

Response: We agree. A beta survey will be conducted in tandem with the alpha survey.

18. Page 2-21, Section 2.2.4, Paragraph 1: How will the radioactivity in the calciner exhaust be controlled?

Response: Exhaust gases will be passed through a wet scrubber. A continuous stack monitor will be utilized to determine that no radioactive material is released through the scrubber.

19. Page 2-21, Paragraph 3: Is the analysis for wash waters to be limited only to gross alpha? If so, provide the rationale and explanation as to how the comparison of the gross alpha values will be made to the MPC's for individual radionuclides in 10 CFR Part Appendix B, Table II to show compliance with these effluent limits for individual radionuclides. See also comment No. 11 above.

Response: Please see response to Comment 11 above. The effluent limit will be set to that of the radionuclide with the lowest effluent limit. Both gross alpha and gross beta will be performed as a screening test on effluent prior to discharge. If the screening test is not passed, individual radionuclides will be determined to ensure that individual radioisotope effluent limitations are met.

20. Page 2-22, Paragraph 5: See general comments.

Response: Please see response to general comments. Also, this section specifically refers to measures to be taken during decontamination of this area to locate potential contamination. For these purposes, the use of gross alpha and gross beta as a screening technique is appropriate. To determine achievement of the decommissioning criteria, the techniques presented in Section 2.1.2.10 will be utilized.

21. Page 2-22 and 2-23, Sections 2.2.5 and 2.2.6: Insufficient information is provided to evaluate the adequacy of the radioanalytical techniques to be used.

Response: The text has been amended to include additional information on the analytical program.

22. Page 2-23, Section 2.2.6, Paragraph 3: Our past experience with several other decommissioning projects at other sites indicates that dilution of contaminated soil is not an appropriate approach to radioactive waste management. This dilution method leads to unsatisfactory results and escalated cost for the licensees to clean up their sites. Also see our comment No. 13 above.

Response: Please see our response to Comment 13 above. Only slightly contaminated soil will be blended. More highly contaminated materials, which we agree would be difficult to blend to an acceptable average concentration, will be disposed of as low-level radioactive waste.

23. Page 2-25, Section 2.2.8.1, Paragraph 3: Beta-gamma detectors should also be calibrated to determine surface activity levels in units of dpm/100 cm².

Response: The final decommissioning survey procedure has been amended to include the use of a gas proportional beta surface counter in addition to other instruments.

24. Page 2-26, Paragraph 1: In the equation for activity, shouldn't the ratio of the detector area to 100 cm² be in the denominator? Is the instrument reading corrected for background.

Response: The equation has been corrected.

25. Page 2-27, Paragraph 2: Why was the reference grid system changed from 10 m and 25 m blocks to 10 ft and 50 ft blocks?

Response: This section refers to soil sampling for the final decommissioning survey. The instrumental measurements for the final decommissioning survey will be performed on the same grid as the initial survey. See also our comments with regard to Comment 5.

26. Page 2-36, section 2.4.7.2, Last Paragraph, Last Sentence: "All reports and documents ... for easy access by authorized representatives of the

Mr. Jerry J. Swift

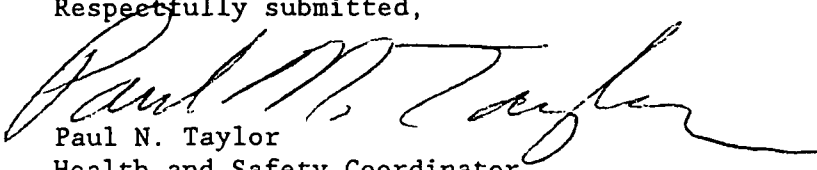
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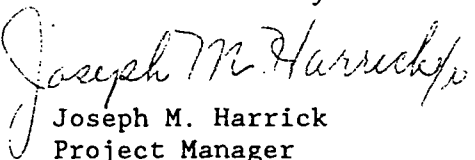
Secretary of the Energy Department." This appears to need correction to refer to the Nuclear Regulatory Commission.

Response: The last sentence has been amended to read "Nuclear Regulatory Commission."

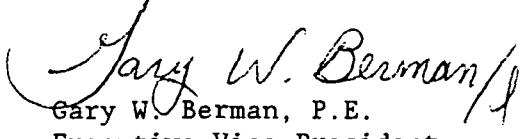
Respectfully submitted,



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Enclosures